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Eclectic Technology

The Rise of LoRa

A tiny LoRa transceiver module and its equally small antenna.

The April edition of this column discussed a novel radiosonde tracking system built around a miniature 70-centimeter data transceiver. You may have noticed in the transceiver ordering details that the acronym "LoRa" appeared as part of the model number.

I've been seeing increasing references to LoRa in wireless circles, including those frequented by hams. You can expect to hear more about this technology in the years to come, so it helps to get at least minimally acquainted.

The Internet of Things

LoRa is an acronym that simply means "long range," which doesn't tell you very much. Dig deeper and you discover that it is a data communications system based on UHF transceiver modules, some of which are the sizes of postage stamps. These modules communicate using a modulation technique derived from chirp spread spectrum (CSS) technology.

LoRa transceivers are capable of sharing data over distances of several miles and more — sometimes much more. There are even LoRa satellites presently in low Earth orbit and they pass data to ground stations that often sport little more than ground-plane antennas.

LoRa achieves its remarkable performance by striking a compromise between sensitivity and data rates. When signals are good, the data rate automatically increases, but as signals decline, the data rate decreases. This is all taking place within a fixed-bandwidth channel of either 125 or 500 kHz (for uplink channels), and 500 kHz (for downlink channels).

LoRa also uses orthogonal spreading factors that adapt to whatever the network conditions may be. Devices communicating with each other over relatively short distances would transmit data at a low spreading factor, because very little link budget would be needed. However, a device that needs to communicate over long distances would transmit with a much higher spreading factor. This higher spreading factor provides increased processing gain, and higher reception sensitivity, although the data rate is lower.

Manufacturers like Semtech and many others are creating low-power wireless platforms with LoRa transceiver modules and they are rapidly becoming the default technologies for Internet of Things (IoT) networks worldwide.

IoT is yet another acronym that will become familiar to more people in the near future. It promises a world in which many of the devices you take for granted will communicate with each other, and the internet, using LoRa. IoT devices will share information, automatically download data, and even install software updates. A refrigerator, for instance, could "know" when you're running out of eggs and automatically place a restocking order.

Industry is already embracing IoT in major ways, especially in automation and remote monitoring applications. In IoT networks that have been deployed to date, LoRa appears to be the technology of choice.

LoRa and Ham Radio

LoRa transceivers are inexpensive and widely available. You can pick up a 100 mW LoRa transceiver module on Amazon, for example, for less than $25. A few hams I've spoken with are wondering if LoRa radios might be put to use creating ad-hoc networks over large areas for applications such as public service. There are LoRa transceiver boards available for use within our 70- and 33-centimeter bands.

Although the price is attractive, keep in mind that the data rates are typically low. This means you're unlikely to be passing voice or video data through a LoRa network. That said, they may be excellent for low-data-rate telemetry, such as a network of weather sensors. For less than $25 a pop, I think it would be fun (and in keeping with the spirit of amateur radio) to buy a couple and see what can be done!